

TOPIC: 292007  
KNOWLEDGE: K1.01 [2.9/3.1]  
QID: B64

What is the definition of a "burnable poison?"

- A. Isotopes manufactured into the fuel with large-scatter macroscopic cross sections to improve neutron thermalization.
- B. Thermal neutron absorbing material added to the fuel during manufacturing to increase initial core fuel load.
- C. Thermal neutron absorbing material produced in the non-fissionable fuel isotopes by fast neutron absorption.
- D. Fast neutron absorbing material loaded into the upper one-third of the core to aid in flattening the thermal neutron flux.

ANSWER: B.

TOPIC: 292007  
KNOWLEDGE: K1.01 [2.9/3.1]  
QID: B136

Burnable poisons are placed in a reactor core to...

- A. increase the amount of fuel that can be loaded into the core.
- B. accommodate control rod depletion that occurs over core life.
- C. compensate for the buildup of xenon-135 that occurs over core life.
- D. ensure that the reactor will always operate in an undermoderated condition.

ANSWER: A.

TOPIC: 292007  
KNOWLEDGE: K1.01 [2.9/3.1]  
QID: B264

Burnable poisons are loaded into the core to...

- A. reduce the rod shadowing effect between shallow rods early in core life.
- B. provide for flux shaping in areas of deep rods during high power operation.
- C. increase the excess reactivity that can be loaded into the core during refueling.
- D. ensure the moderator coefficient of reactivity remains negative throughout core life.

ANSWER: C.

TOPIC: 292007  
KNOWLEDGE: K1.01 [2.9/3.1]  
QID: B364 (P362)

Which one of the following is not a function performed by burnable poisons in an operating reactor?

- A. Provide neutron flux shaping.
- B. Provide more uniform power density.
- C. Counteract the effects of control rod burnout.
- D. Allow higher fuel enrichment of initial core load.

ANSWER: C.

TOPIC: 292007  
KNOWLEDGE: K1.01 [2.9/3.1]  
QID: B1265

Gadolinium (Gd-155 and -157) is used instead of boron (B-10) as the \_\_\_\_\_ material; when compared to gadolinium, boron has a much \_\_\_\_\_ cross section for absorbing thermal neutrons.

- A. control rod; larger
- B. burnable poison; larger
- C. control rod; smaller
- D. burnable poison; smaller

ANSWER: D.

TOPIC: 292007  
KNOWLEDGE: K1.01 [2.9/3.1]  
QID: B2564 (P2164)

Why are burnable poisons installed in a reactor core?

- A. To shield reactor fuel from thermal neutron flux until later in core life
- B. To compensate for control rod burnout that occurs over core life
- C. To flatten the radial thermal neutron flux distribution at the end of core life
- D. To ensure a negative moderator temperature coefficient early in core life

ANSWER: A.

TOPIC: 292007  
KNOWLEDGE: K1.03 [2.4/2.7]  
QID: B564 (P264)

Just prior to refueling, control rods are nearly fully withdrawn at 100% power. After refueling, the control rods are inserted much farther into the core at 100% power.

Which one of the following is the primary reason for the change in full power control rod position?

- A. Reactivity from power defect at beginning of core life (BOL) is much greater than at end of core life (EOL).
- B. Reactivity from void coefficient at EOL is much greater than at BOL.
- C. The excess reactivity in the core at BOL is much greater than at EOL.
- D. The integral control rod worth at EOL is much greater than at BOL.

ANSWER: C.

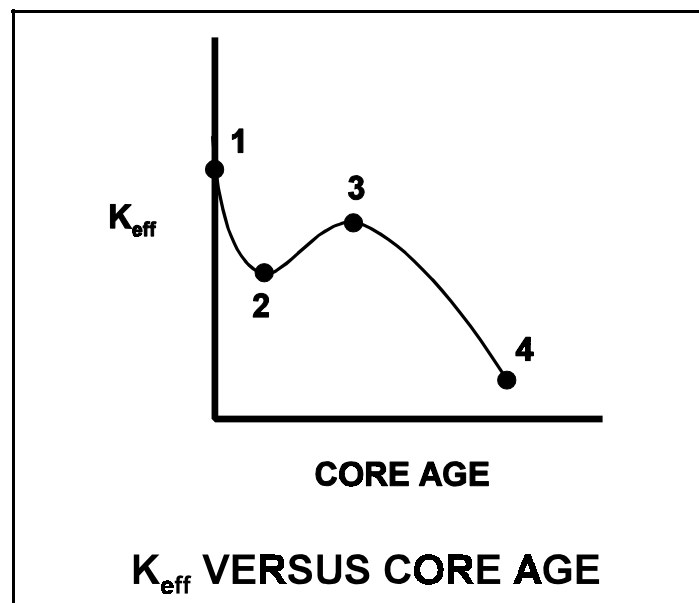
TOPIC: 292007  
KNOWLEDGE: K1.03 [2.4/2.7]  
QID: B1163 (P1264)

Refer to the drawing of  $K_{\text{eff}}$  versus core age for a reactor core following a refueling outage (see figure below).

Which one of the following is responsible for the majority of the decrease in  $K_{\text{eff}}$  from point 1 to point 2?

- A. Depletion of fuel
- B. Burnout of burnable poisons
- C. Initial heat-up of the reactor
- D. Buildup of fission product poisons

ANSWER: D.



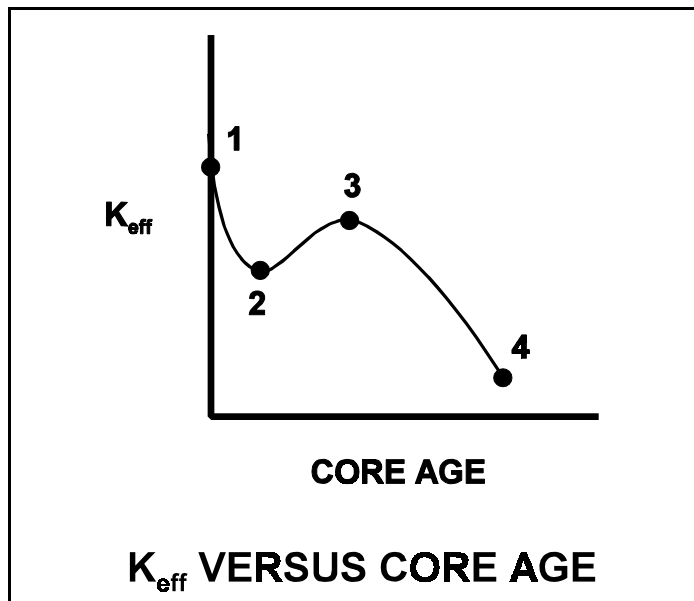
TOPIC: 292007  
KNOWLEDGE: K1.03 [2.4/2.7]  
QID: B1364 (P1864)

Refer to the drawing of  $K_{\text{eff}}$  versus core age (see figure below).

The change in  $K_{\text{eff}}$  from point 2 to point 3 is caused by...

- A. depletion of fuel.
- B. depletion of control rods.
- C. burnout of burnable poisons.
- D. burnout of fission product poisons.

ANSWER: C.



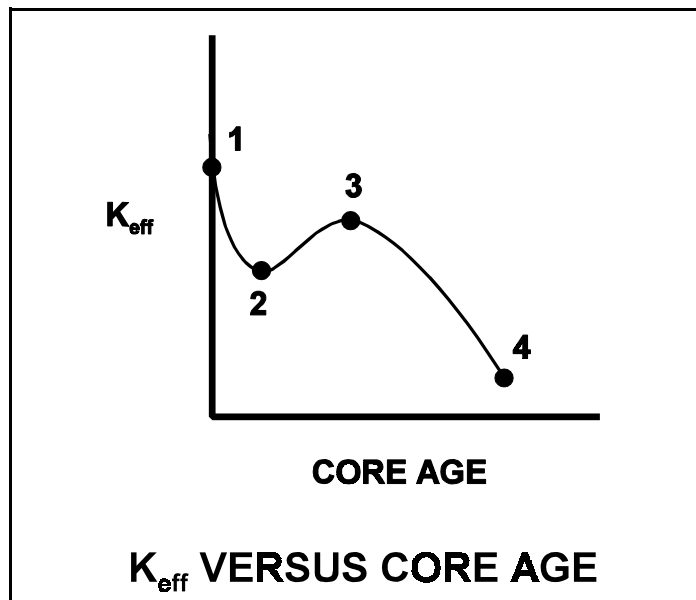
TOPIC: 292007  
KNOWLEDGE: K1.03 [2.4/2.7]  
QID: B1563 (P1563)

Refer to the drawing of  $K_{\text{eff}}$  versus core age (see figure below).

The major cause for the change in  $K_{\text{eff}}$  from point 3 to point 4 is...

- A. depletion of U-235.
- B. depletion of U-238.
- C. burnout of burnable poisons.
- D. buildup of fission product poisons.

ANSWER: A.



TOPIC: 292007  
KNOWLEDGE: K1.03 [2.4/2.7]  
QID: B3264

Refer to the curve of  $K_{\text{eff}}$  versus core age for an operating reactor (see figure below).

The reactor has been operating at 100% power for several weeks and is currently operating between points 2 and 3 on the curve.

Assuming reactor recirculation flow rate remains the same, what general control rod operation will be necessary to maintain the reactor operating at 100% power until point 3 is reached?

- A. Withdrawal for the entire period.
- B. Withdrawal at first, then insertion.
- C. Insertion for the entire period.
- D. Insertion at first, then withdrawal.

ANSWER: C.

